

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	((("6030900") or ("20030040196")).PN.	US-PGPUB; USPAT	OR	OFF	2007/09/14 15:55
L2	5	((("6203613") or ("6465371") or ("6869638") or ("7112539") or ("20030232511")).PN.	US-PGPUB; USPAT	OR	OFF	2007/09/14 16:02
L3	4579	(silicon adj (oxide or dioxide)) and (organic with precursor)	US-PGPUB; USPAT	OR	ON	2007/09/14 16:51
L4	660	3 and ozone	US-PGPUB; USPAT	OR	ON	2007/09/14 16:04
L5	459	4 and (CVD or ALD)	US-PGPUB; USPAT	OR	ON	2007/09/14 16:46
L6	15	5 and (precursor with (TMDSO or HMDSO or HMDSN or TEMASi))	US-PGPUB; USPAT	OR	ON	2007/09/14 16:23
L7	94	(silicon adj (oxide or dioxide)) and (organic with precursor)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/09/14 16:24
L9	7	(silicon adj (oxide or dioxide)) and (organic with precursor) and ozone	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/09/14 16:45
L10	156	4 and ALD	US-PGPUB; USPAT	OR	ON	2007/09/14 16:46
L11	7	10 and @ad<"20020818"	US-PGPUB; USPAT	OR	ON	2007/09/14 16:50
L12	1657	438/780,787,789,790.ccls. and @ad<"20020818"	US-PGPUB; USPAT	OR	ON	2007/09/14 16:51
L13	1174	12 and (silicon adj (oxide or dioxide))	US-PGPUB; USPAT	OR	ON	2007/09/14 16:52
L14	356	13 and precursor	US-PGPUB; USPAT	OR	ON	2007/09/14 16:52

US-PAT-NO: 6465044

DOCUMENT-IDENTIFIER: US 6465044 B1

TITLE: Chemical vapor deposition of silicon oxide films using alkylsiloxane oligomers with ozone

----- KWIC -----

Abstract Text - ABTX (1):

This invention relates to a method of depositing silicon oxide films on the surface of semiconductor substrates, and more particularly to depositing such films by chemical vapor deposition using alkylsiloxane oligomers precursors with ozone.

TITLE - TI (1):

Chemical vapor deposition of silicon oxide films using alkylsiloxane oligomers with ozone

Brief Summary Text - BSTX (2):

This invention relates to a method of depositing silicon oxide films on the surface of semiconductor substrates, and more particularly to depositing such films by chemical vapor deposition using alkylsiloxane oligomers precursors with ozone.

Brief Summary Text - BSTX (4):

Chemical vapor deposition (CVD) of silicon dioxide is a widely used manufacturing technology for the deposition of dielectric films or layers used in the production of semiconductors. There are two main CVD processes currently used to deposit silicon dioxide (SiO_2) on semiconductor substrates or wafers. The two main processes are a silane/oxygen (SiH_4/O_2) process and a triethoxysilane/ozone (TEOS/ O_3) process. Of these, the TEOS/ O_3 process has been widely employed in semiconductor manufacturing due to the superior quality of the SiO_2 films deposited by this process, especially with regard to the gap filling capability of the film. This advantage becomes especially important in light of the decreasing feature sizes and increasing aspect ratios of the semiconductor device features in the present day very large scale integrated (VLSI) manufacturing. Thus, efforts have been made to enhance the gap filling capability of the TEOS/ O_3 process.

Brief Summary Text - BSTX (5):

Apart from the work on understanding and improving the TEOS/O.sub.3 process for better gap fill ability, efforts have also been made to identify new organosilicon precursors that could be used to deposit SiO.sub.2 films of quality superior or comparable to those deposited by the TEOS/O.sub.3 process. These new organosilicon **precursors** include hexamethyldisiloxane (**HMDSO**), hexamethyl disilazane (HMDS), octamethylcyclotetrasiloxane (OMCTS) and 2,4,6,8-tetramethylcyclo tetra siloxane (TMCTS). The SiO.sub.2 films deposited from these precursors had properties similar or poorer compared to the films deposited using TEOS/O.sub.3 and therefore offered no advantage over the already very established TEOS/O.sub.3 chemistry.

Brief Summary Text - BSTX (6):

In the development of new chemical precursors, the different types of **CVD** systems must be considered. A variety of **CVD** systems are utilized in the semiconductor industry, and are typically divided into two groups: thermal systems and plasma enhanced systems. Thermal systems utilize thermal energy to disassociate the chemical precursors, where they react and deposit a layer or film on the substrate. Thermal **CVD** systems typically operate at atmospheric pressure (referred to as APCVD systems) or low pressure (referred to as LPCVD systems). In contrast, plasma enhanced systems utilize ionized gases (i.e., a plasma) to disassociate the chemicals. While the two types of systems are used to perform the same function, i.e. to deposit a layer on a substrate, the systems have very different reactor and system designs, and operate under very different reaction kinetics and process conditions. It has been found that while one process chemistry may work well for one type of **CVD** system, it is not well suited for the other type of **CVD** system. For example, silane and oxygen (SiH.sub.4 /O.sub.2) as precursors are very reactive, and can be explosive, and due to this problem the TEOS/O.sub.3 precursor chemistry has found wide use in the thermal **CVD** type systems. The TEOS/O.sub.2 precursor chemistry has been found to be suitable when employed in plasma **CVD** type systems, however TEOS/O.sub.3 precursor chemistry has not. SiH.sub.4 /O.sub.2 precursor chemistry has found use in plasma **CVD** systems.

Brief Summary Text - BSTX (10):

It is a related object of the present invention to provide a method of depositing a film which promotes reduced cost of ownership (CoO) of the **CVD** system.

Brief Summary Text - BSTX (11):

In the present invention, a method of depositing oxide films or layers using

volatile alkylsiloxane precursors is provided. Specifically, the alkylsiloxane precursors of the invention are of the formula: $(\text{CH}_3)_3\text{Si}[\text{OSi}(\text{CH}_3)_2]_n\text{OSi}(\text{CH}_3)_3$ where $n=1$ and 2 . Such precursors thermally react with ozone to produce silicon dioxide for depositing on the surface of semiconductor substrates, and of significant advantage are particularly useful for sub 0.18 micron device applications. In fact, a dimer of such alkylsiloxane, hexamethyldisiloxane, has been investigated earlier. Of particular advantage, the process is a thermal CVD method and does not require the complex addition of plasma CVD technologies. In addition, by co-injection of dopant precursors such as phosphorus and/or boron precursors with the alkylsiloxane precursor in the presence of ozone, phosphorusilicate glass (PSG), borosilicate glass (BSG) and borophosphorusilicate glass (BPSG) films can also be formed using the thermal CVD method of the present invention. The inventors have found that significantly lower chemical usage and excellent gap fill can be achieved by using the method of the present invention as compared to using conventional TEOS, where the same film quality and deposition rate were maintained. Further, according to one embodiment of the present invention, octamethyltrisiloxane (OMTS) was mixed with ozone in the gas phase. It was found that this OMTS process generated less particulates in the exhaust lines as compared with conventional TEOS processes, which can significantly reduce chamber exhaust cleaning during high volume manufacturing. The inventors have also found that the deposition rate of silicon dioxide according to the method of the present invention is much less sensitive to wafer temperature than conventional processes, which is a very significant factor towards improvement of the silicon dioxide deposition thickness uniformity.

Drawing Description Text - DRTX (3):

FIG. 1 is a schematic diagram of one embodiment of an CVD system which may be employed with the method of the present invention.

Detailed Description Text - DETX (4):

Thus, suitable alkylsiloxane precursors of the present invention include: octamethyltrisiloxane (OMTS) and decamethyltetrasiloxane. The alkylsiloxane precursor is reacted with ozone in thermal CVD system to deposit a layer or film of oxide (such as silicon dioxide) on the surface of a substrate.

Detailed Description Text - DETX (5):

The method of the present invention further comprises thermally reacting the alkylsiloxane precursor and ozone in the deposition chamber to deposit an oxide film on the surface of the substrate. The thermal reaction is carried out at a temperature in the range of approximately 300.degree. C. to 600.degree. C., preferably at a temperature in the range of approximately 350.degree. C. to

550.degree. C. with a temperature in the range of approximately 450.degree. C. to 550.degree. C. being most preferred. The reaction may be carried out at different pressures in the CVD chamber. In one embodiment, the method is carried out at low pressure, specifically in the range of approximately 100 to 700 torr, and more preferably at a pressure of approximately 200 to 600 torr. In an alternative embodiment, the method is carried out at atmospheric pressure, i.e. approximately 760 torr.

Detailed Description Text - DETX (6):

Another important aspect of the present inventive method is the concentration ratio of the reactants, or Mol %, specifically, the molar ratio of the ozone to the silicon content in the alkylsiloxane precursor (expressed as: O.sub.3 :Si). When operating at low pressure, the mol ratio of ozone to silicon is in the range of approximately 3 to 20 Mol %, more preferably in the range of approximately 5 to 15 Mol %, with an O.sub.3 :Si ratio of 6 to 14 Mol % being most preferred. When operating at atmospheric pressure, the molar ratio of ozone to silicon is in the range of approximately 3 to 20 Mol %, more preferably in the range of approximately 5 to 15 Mol %, with an O.sub.3 :Si ratio of 6 to 14 Mol % being most preferred. To achieve such concentration ratios, the gas flow rates of the alkylsiloxane precursor will be selected appropriately. The actual values of the gas flow rates will vary depending upon a number of known factors, such as the equipment design, operating pressure and the deposition rate desired.

Detailed Description Text - DETX (7):

A thermal CVD system 20 suitable for practicing the method of the present invention is illustrated in FIG. 1. FIG. 1 is a simplified schematic diagram of the CVD system 20 which generally includes a CVD chamber 22 which houses a heated chuck or susceptor 24 for supporting a wafer or substrate 26 adjacent an injector 28. A deposition region 30 is formed between the injector 28 and the substrate 26. The substrate may be moved relative to the injector 28 via translation means 32. It is important to note that while one CVD system is shown, the inventive method may be practiced with other thermal CVD systems, such as for example a conveyORIZED atmospheric pressure CVD (APCVD) system as described in U.S. Pat. No. 4,834,020 which is hereby incorporated by reference.

Detailed Description Text - DETX (10):

To deposit the film, the vapor phase alkylsiloxane is preferably diluted with an inert gas, such as nitrogen, and flowed to the injector 28. Other reactant gases, in this case ozone (O.sub.3) are also conveyed to the injector 28. Alkylsiloxane vapor mixes with ozone at the outlet of the gas injector and

is delivered to the surface of the wafer or substrate. Preferably the substrate is heated to a temperature in the range of approximately 300 to 600.degree. C. when the pressure is either in the range of 200 to 600 torr, or at atmospheric pressure.

Detailed Description Text - DETX (11):

The alkylsiloxane reacts in the gas phase with ozone to form additional intermediates. The deposition rate can be a function of this rate as well depending on the operating conditions. The alkylsiloxanes and the intermediates diffuse to the heated surface and then react to form the solid film on the surface of the substrate.

Detailed Description Text - DETX (12):

Of particular advantage, the alkylsiloxane precursor of the present invention contains more than one Si atom per molecule of precursor. The conventional TEOS precursor contains only one Si atom per molecule of precursor. Thus, the total amount of the precursor used according to the present invention can be reduced, as compared to the equivalent amount of TEOS, while achieving the same deposition rate. Using less precursor has significant advantages; for example, it inhibits powder formation and also results in a smaller quantity of by-products being formed as compared to the conventional TEOS/ozone process. Therefore, the longevity of the systems which are affected by the by-product and powder formation can be enhanced and problems of powder formation can be mitigated.

Detailed Description Text - DETX (13):

Moreover, because a molecule of the alkylsiloxanes have more than one atom of Si in contrast to TEOS, the amount of silicon dioxide deposited is greater in the method of the invention. Further, the diffusion rate for the alkylsiloxanes has been found to be only marginally smaller compared to TEOS. These two factors result in a comparable or enhanced gap fill ability of the precursor according to the present invention when compared to conventional TEOS.

Detailed Description Text - DETX (14):

In another aspect of the present invention, the alkylsiloxane precursor can be mixed with dopant sources such as alkylborate and/or alkylphosphate or alkylphosphite in the vapor phase and co-injected with ozone on to the substrate surface to produce doped silicon dioxide such as BSG, PSG and BPSG.

Detailed Description Text.- DETX (16):

By introducing a lower amount of chemical without reducing the deposition

rate according to the present invention, powder formation due to gas-phase reactions is mitigated, because gas phase reaction is a function of chemical concentration in the gas-phase. Consequently, the cleaning overhead of deposition in the chamber and exhausted areas can be reduced significantly, providing a significant advantage. Further, the lower flow rate reduces the formation of by-products. This enhances the longevity of the components of the CVD system which degrade and corrode over time from exposure and attack by these by-products.

Detailed Description Text - DETX (20):

The experiments were conducted in a CVD system equipped with a linear injector as shown in FIGS. 1 and 2, respectively. A vacuum pump (not shown) is attached to the chamber and isolated through a valve so that the pressure of the chamber can be controlled below atmospheric conditions. The liquid flow rates of TEOS and OMTS are controlled by a liquid flow meter (LFM) and sent to the DLI where all of the injected fluid is completely vaporized. The vaporizer temperature is monitored and controlled using a temperature controller. The vapor is then introduced through the inner port 40 of the injector as shown in FIG. 2 along with dilution nitrogen. The lines from the DLI 36 to the injector 28 are heated to 120.degree. C. to prevent condensation of the precursor vapor.

Detailed Description Text - DETX (21):

Ozone is generated by passing oxygen through a Sumitomo (Model SGN-04CUA-95-8) ozone generator (not shown). The output from the ozone generator consists of a mixture of oxygen and ozone which is introduced in the reactor through the outer port 40 of the injector 28, along with nitrogen as a dilution gas. The ozone concentration can be varied by varying the power supplied to the cells generating the ozone.

Detailed Description Text - DETX (22):

Ozone, OMTS and nitrogen gases are conveyed through the injectors into the process chamber. In this embodiment, the process chamber employs three injectors, and the gases are separately conveyed to ports 40 and each injector 28. Side ports 41 and channels 47 are used to provide nitrogen gas flow to the sides of the injectors 28 which helps to isolate the deposition region 30 and to reduce the buildup of powder formation on the surface of the injector 28 and chamber 22. The gases are exhausted through the exhaust channels 48 on either side of each injector 28. While a specific injector design is described, it should be understood by those of ordinary skill in the art that other injection- and thermal CVD system configurations may be used to practice the method of the present invention.

Detailed Description Text - DETX (29):

The deposition temperature was varied from 300-500.degree. C. and its effect on the deposition rate and film properties such as wet etch ratio, shrinkage and gap fill capability was studied. The pressure, ozone to silicon concentration ratio ($O_{sub.3} : Si$), and Si flow rate were held constant at 200 torr, 10.3 and 0.009 mol/min, respectively. The results for TEOS and OMTS are compared and presented in FIGS. 3, 4 and 5.

Detailed Description Text - DETX (34):

Another important property of the film is the wet etch ratio. The wet etch ratio (WER) was determined by comparing the etch rate of the deposited CVD film to the etch rate of a thermal oxide. The WER as a function of the deposition temperature is presented in FIG. 4 at 200 torr, $O_{sub.3} : Si = 10$ and Si flow of 0.009 mol/min. The data shows that the WER for films deposited with OMTS remained fairly constant at about 3 with changes in the deposition temperature, whereas the WER for films deposited with TEOS decreased from about 7 to about 3 when the deposition temperature was increased from 300.degree. C. to 500.degree. C. This suggests that the density of the films deposited from TEOS increased with an increase in the deposition temperature but was fairly constant with respect to the deposition temperature when OMTS was used.

Detailed Description Text - DETX (39):

The operating pressure of the CVD chamber 22 was varied from 200 to 600 torr at 400.degree. C. and 450.degree. C. and its effect on the film properties was studied. The deposition rate using TEOS and OMTS increased with increasing pressure as illustrated in FIG. 6. This increase in the deposition rate can be attributed to an increase in the partial pressure of the precursors with the increase in pressure.

Detailed Description Text - DETX (40):

Although it is not shown in FIG. 6, the deposition rate at 400.degree. C. using OMTS jumped up to 1000 .ANG./min at 700 torr. Considering that the flow rate of OMTS is nearly one-third that of TEOS for an equivalent amount of silicon available, one can use only one-third of the amount of OMTS and still achieve the same throughput as that provided from TEOS. This results in a significant reduction in the cost of ownership (CoC) of the CVD system and presents a significant advance in the art.

Detailed Description Text - DETX (42):

The effect of pressure on the shrinkage of the films is shown in FIG. 8. The data shows that shrinkage typically increases with pressure (i.e. an

increase in deposition rate). It is possible that at higher pressures and higher deposition rates the decomposition of the precursor is relatively incomplete resulting in a greater amount of organic and water-like species being expelled during the annealing cycle. However, this needs further investigation in order to make any definite conclusions.

Detailed Description Text - DETX (44):

Next, the ozone to silicon concentration ratio (O.sub.3 : Si) was evaluated. FIG. 9 shows that increasing the O.sub.3 : Si ratio from approximately 5 to 11 results in a linear increase in the deposition rate for TEOS and OMTS. This is consistent with TEOS studies reported in the literature. The WER and the shrinkage did not show any appreciable change with increases in the O.sub.3 : Si ratio for both TEOS and OMTS. The WER remained constant at about 4 and 3 for TEOS and OMTS, respectively. The O.sub.3 : Si ratio did not affect the shrinkage which remained constant at about 8 and 6 for TEOS and OMTS, respectively.

Detailed Description Text - DETX (50):

Of further advantage, the method of the present invention promotes the reduction of the detrimental powder buildup. With the prior art TEOS methods, significant powder (typically the oxide and by-products) formation occurs during the CVD reaction. The powder deposits on the injector and chamber surfaces, clogs the exhaust lines and damages the pumps. The powder becomes a significant source of particulate contamination in the films. The powder buildup decreases the longevity of the CVD system and increases the downtime of the system since the powder must be frequently cleaned from the surfaces. The alkylsiloxane precursor of the present invention reduces the powder build-up because to deposit the same amount of oxide, less chemical is required which in turn generates a lower amount of by-products. Further, the inventors believe that the alkylsiloxane compound, in particular OMTS, is more stable than TEOS, and is less likely to react in the gas phase thereby generating less particles.

Detailed Description Text - DETX (52):

In another illustrative embodiment of the present invention, the inventive method was practiced in a commercially available WJ-999 APCVD system which operates at atmospheric pressure. Only the first two chambers were used for deposition due to flow containment problems. The system was profiled at each temperature set point such that the left, right and center were within 5.degree. C. of each other. The bubbler temperatures for OMTS were dropped to 50.degree. C. (compared to 75.degree. C. for TEOS) in order to reduce the chemical flow from 60 sccm per chamber (for TEOS) to 20 sccm per chamber (for OMTS). No other changes were made to the system. The OMTS, nitrogen, and

ozone gas flows combined through the injector ports were maintained at 6 slm, 14 slm and 10 slm through the inner, separator and outer ports, respectively. The ozone concentration was varied at each temperature from 158-66 /gm.sup.3 such that the O.sub.3 :Si ratio varied as 12, 10, 7 and 5. The deposition temperature was varied from 350.degree. C. to 550.degree. C. in steps of 50.degree. C. No dopants were added to the system.

Detailed Description Text - DETX (57):

The wet etch ratio (WER) was determined by comparing the etch rate of the CVD film to the etch rate of a thermal oxide. The data in FIG. 14 shows that the WER for OMTS and TEOS were comparable and decreased with increase in the deposition temperature as expected.

Detailed Description Text - DETX (64):

Silicon dioxide films deposited using alkylsiloxane precursors show qualities such as the wet etch ratio, shrinkage, carbon content and gap filling ability that are comparable to the films deposited from TEOS. Further, this precursor costs less than TEOS and results in a lower generation of by-products compared to TEOS. This can result in enhanced longevity of the injectors and CVD chambers. The deposition rate of the films using OMTS, is lower than that of OMTS in the range of conditions explored since one-third the amount of chemical was used. However, the deposition rate is comparable to that of TEOS even when one-third of OMTS (compared to TEOS) is used.

Detailed Description Paragraph Table - DETL (2):

TABLE 2 Deposition Process conditions Pressure (torr) 200-600 Wafer temperature (.degree. C.) 300-500 TEOS flow rate (mol/min) 9 .times. 10.sup.-3 OMTS flow rate (mol/min) 3 .times. 10.sup.-3 Ozone/oxygen flow rate (slm) 30 Ozone concentration (g/m.sup.3) 75-165 Inner port dilution nitrogen (slm) 25 Outer port dilution nitrogen (slm) 25 Separator nitrogen flow (slm) 10 Bubbler temperature (.degree. C.) 140

Claims Text - CLTX (1):

1. A method of depositing an oxide film on the surface of a semiconductor substrate in a chemical vapor deposition (CVD) system having at least one chamber, comprising the steps of: providing an alkylsiloxane precursor having the general formula of:

Claims Text - CLTX (2):

where n is 1 or 2 to said chamber; providing ozone to said chamber; and thermally reacting said alkylsiloxane precursor and ozone to deposit an oxide film on the surface of the substrate.

Claims Text - CLTX (5):

4. The method of claim 1 wherein the alkylsiloxane and ozone are provided at a molar concentration ratio expressed as ozone to silicon (O.sub.3 Si) in the range of approximately 5 to 15 at a pressure of approximately 200 to 600 torr.

Claims Text - CLTX (6):

5. The method of claim 1 wherein the alkylsiloxane and ozone are provided at a molar concentration ratio expressed as ozone to silicon (O.sub.3 Si) in the range of approximately 5 to 15 at a pressure of approximately atmospheric pressure.

Other Reference Publication - OREF (1):

Lin, et al. "Modeling and Analysis of CVD Processes in Porous Media for Ceramic Composite Preparation", Chemical Engineering Science, vol. 46, No. 12, 1991, pp. 3067-3080. (No month avail.).

Other Reference Publication - OREF (3):

Shareef, et al. "Role of Gas Phase Reactions in Subatmospheric Chemical-Vapor Deposition Ozone/TEOS processes for Oxide Deposition", J. Vac. Sci. Technol. B 14(2), Mar/Apr. 1996, pp. 772-774.

Other Reference Publication - OREF (4):

Egashira, et al. "Step-Coverage Simulation for Tetraethoxysilane and Ozone Atmospheric Pressure Chemical Vapor Deposition ", J. Electrochem. Soc., vol. 140, No. 8, Aug. 1993, pp. 2309-2312.

Other Reference Publication - OREF (6):

Ikeda, et al. "The Effects of Alkoxy Functional Groups on Atmospheric-Pressure Chemical Vapor Deposition Using Alkoxysilane and Ozone", J. Electrochem. Soc., vol. 142, No. 5, May 1995, pp. 1659-1662.

Other Reference Publication - OREF (8):

Murase, et al. "Thermal Desorption Studies of Silicon Dioxide Deposited by Atmospheric-Pressure Chemical Vapor Deposition using Tetraethylorthosilicate and Ozone", J. Electrochem. Soc., Vol. 140, No.6, Jun. 1993 pp. 1722-1727.

Other Reference Publication - OREF (9):

IslamRaja, et al. "Two Precursor Model for Low-Pressure Chemical Vapor Deposition of Silicon Dioxide From Tetraethylorthosilicate", J. Vac. Sci. Technol. B 11(3), May/Jun. 1993, pp. 720-726.

Other Reference Publication - OREF (10):

Nakano, et al. "A Model of Effects of Surface Pretreatment by Organic Solvents on Ozone-Tetraethoxysilane Chemical Vapor Deposition", J. Electrochem. Soc., Vol. 142, No. 2, Feb. 1995 pp. 641-644.

Other Reference Publication - OREF (11):

Kim, et al. "Analytical Model for Chemical Vapor Deposition of SiO₂ Films using Tetraethoxysilane and Ozone", Journal of Crystal Growth, No. 140, 1994, pp. 315-326. (No month avail).

Other Reference Publication - OREF (12):

Ikeda, et al. "Characteristics of Silicon Dioxide Films on Patterned Substrates Prepared by Atmospheric-Pressure Chemical vapor Deposition Using Tetraethoxysilane and Ozone", J. Electrochem. Soc., Vol. 143, No. 5, May 1996, pp. 1715-1718.

Other Reference Publication - OREF (13):

Hazari, et al. "Characterization of Alternative Chemistries for Depositing PECVD Silicon Dioxide Films", DUMIC Conference, Feb. 16-17, 1998 pp. 319-326.

Other Reference Publication - OREF (14):

Garcia, et al. "Chemical Vapor Deposition of Silicon Dioxide from Hexamethyldisilazane and Ozone/Oxygen", Journal of Chemical Vapor Deposition, Vol. 1, Jan. 1993, pp. 232-251.

Other Reference Publication - OREF (16):

Fujino, et al. "Low Temperature and Atmospheric Pressure CVD Using Polysiloxane, OMCTS, and Ozone", J. Electrochem. Soc., Vol. 138, No. 12, Dec. 1991, pp. 3727-3732.

Other Reference Publication - OREF (17):

Fujino, et al. "Low-Temperature Atmospheric-Pressure Chemical Vapor Deposition Using 2,4,6,8-Tetramethylcotetrasiloxane and Ozone", Jpn. J. Appl. Phys. Vol. 33, 1994, pp. 2019-2024. (No month avail.).

Other Reference Publication - OREF (18):

Fujino, et al. "Low Temperature, Atmospheric Pressure CVD Using Hexamethyldisiloxane and Ozone", J. Electrochem. Soc., Vol. 139, No. 8, Aug. 1992 pp. 2282-2287.